FLUKE®

Biomedical

INCU™

Incubator Analyzer

Operators Manual

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Notices

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Safety Considerations

Warnings and Cautions

Use of this instrument is restricted to qualified personnel who recognize shock hazards and are familiar with safety precautions used when operating electrical equipment. Read the manual carefully before operating the INCU.

☛ The following warning and informational symbols may be found on the INCU*.*

Symbol	Description
	Alternating Current
	Caution: Refer to accompanying documentation
	Master ON/OFF,switch. Push for OFF or ON
	Direct / Alternating Current
	Direct Current
	Enclosure with double insulation or reinforced insolution
	Fuse
I P 30	**Class of protection see Appendix A**

Hazard Warnings

- **Warning! Power Rating.** The INCU mains power input must be connected using an external power supply that provides voltage and current within the specified rating for the system.

- **Warning! Internal Voltage.** Always turn off the power switch and unplug the power cord before cleaning the outer surface of the INCU.

- **Warning! Liquids.** Avoid spilling liquids on the analyzer; fluid seepage into internal components creates a potential shock hazard. Do not operate the instrument if internal components are exposed to fluid.

- **Warning! "Do not use in the presence of oxygen".** The Air Flow sensor is hot wire technology and is a source of combustion if used in the presence of oxygen within the incubator. Use the INCU **only** in ambient oxygen conditions.

- **Warning! "Use only approved battery charger."** The INCU contains a lead-acid rechargeable battery. Use only the approved charger with proper voltage and current ratings; otherwise, damage to the unit may result.

Precautions

The following precautions are provided to help you avoid damaging the system:

- **Caution: Service.** Authorized service personnel should service the INCU. Only qualified technical personnel should perform troubleshooting and service procedures on internal components.

- **Caution: Environmental Conditions.** Do not expose the system to temperature extremes. Ambient temperatures should remain between 18°C to 40°C. System performance may be adversely affected if temperatures fluctuate above or below this range.

- **Caution: Do NOT Immerse.** Clean only with a mild detergent, and gently wipe down with a clean, lint-free cloth.

- **Caution:** Electromagnetic radiation may affect the noise measurement.

Applicable Testing Standards

The INCU has been tested by an independent laboratory and meets the requirements listed here.

Safety Requirements

EC Directive 73/23/EEC	IEC 1010-1, Safety requirement for electrical equipment for measurement, control and laboratory use, Part 1: General Requirements.
North America	Battery Charger is UL marked.

Electromagnetic Interference and Susceptibility

The system meets the requirements of EC Directive 89/336/EEC Electromagnetic Compatibility (see page viii).

☛ USA FCC Class A

Warning: Changes or modifications to this unit not expressly approved by the manufacturer could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules.

These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. Like all similar equipment, this equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause interference, in which case the user will be required to correct the interference at his/her own expense.

☛ Canadian Department of Communications Class A

This digital apparatus does not exceed Class A limits for radio emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le present appareil numerique n'met pas du bruits radioelectriques depassant les limites applicables aux appareils numerique de la Class A prescrites dans le Reglement sur le brouillage radioelectrique edicte par le ministere des Communications du Canada.

Based on the testing standards below, this device bears the CE mark.

EC Directive 89/336/EEC Electromagnetic Compatibility

☛ **Emissions - Class B**

NFEN 55022 Class B (12/94) Radio disturbance

☛ **Immunity**

The system has been type tested by an independent, accredited testing laboratory and found to meet the requirements for Immunity. Verification of compliance was conducted to the limits and methods of the following:

EN 61000-4-2 (1995) Electrostatic Discharge

EN 61000-4-3 (1984) Radiated EM Fields (electromagnetic radiation may affect the noise measurement)

EN 61000-4-4 (1995) Electrical Fast Transient/Burst

EN 61000-4-5 (1995) Surge Immunity

EN 61000-4-6 (1996) Conducted Disturbances

EN 61000-4-11 (1994) Voltage Dips, Short Interruptions and Variations (N/A; Battery buffers transients)

EC Directive 73/23/EEC Low Voltage (User Safety)

The system has been type tested by an independent testing laboratory and found to meet the requirements of EC Directive 73/23/EEC for Low Voltage. Verification of compliance was conducted to the limits and methods of the following:

IEC 1010-1 1990 and Amendments 1 1992 and Amendments 2 1995

“Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use, Part 1: General requirements” (including amendments 1 and 2).

Warranty

This Warranty is limited and applies only to new products, except for computer-based software, which is covered under a separate Warranty Policy, manufactured by Fluke Biomedical. Fluke Biomedical makes no warranty whatsoever regarding the condition of used products.

Fluke Biomedical warrants the instrument (hereinafter collectively referred to as “Products” or “Product”) for a period of one (1) year from the original purchase date against defective materials or workmanship. This Warranty is limited to the original purchaser (the “Purchaser”) and cannot be assigned or transferred. All claims under this Limited Warranty must be made in writing to Fluke Biomedical, Attention: Service Department. Purchaser must ship the Product to Fluke Biomedical, postage pre-paid. Fluke Biomedical shall either repair or replace with new or like new, at its option and without cost to the Purchaser, any Product which in Fluke Biomedical’s sole judgment is defective by reason of defects in the materials or workmanship.

This Warranty is VOID if the Product has been damaged by accident or misuse, or has been damaged by abuse or negligence in the operation or maintenance of the Product, including without limitation unsafe operation, operation by untrained personnel, and failure to perform routine maintenance. This Warranty is VOID if the Product has been repaired or altered by persons not authorized by Fluke Biomedical, or if the Product has had the serial number altered, effaced, or removed. This Warranty is VOID if any of the Products has not been connected, installed or adjusted strictly in accordance with written directions furnished by Fluke Biomedical. Batteries, fuses, light bulbs, and other “consumable” items used in any of the Products are not covered by this Warranty. Software utilized in conjunction with any of the Products is not covered by the terms of this Warranty but may be covered under a separate Fluke Biomedical software warranty.

We will continue to stock parts for a maximum period of five (5) years after the manufacture of any equipment has been discontinued. Parts shall include all materials, charts, instructions, diagrams, and accessories that were furnished with the standard models.

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THIS WARRANTY IS VOID UNLESS THE PURCHASE REGISTRATION CARD HAS BEEN COMPLETED AND MAILED TO US WITHIN TEN (10) DAYS OF PURCHASE.

About This Manual

This manual provides a complete description of the INCU Incubator Analyzer and its applications. The manual is organized as follows:

- **Chapter 1, Overview:** An introduction to the INCU and optional accessories
- **Chapter 2, Installation:** How to connect the INCU and install the PC software
- **Chapter 3, General Operation:** INCU keypad functions, setup, and stand-alone operation
- **Chapter 4, PC Software Operation*:*** PC software operation
- **Chapter 5, Safety, Displayed Messages, Troubleshooting, and Support**
- **Appendix A, INCU Specifications**
- **Appendix B, INCU Report Examples**
- **Appendix C, DAT File Format**

Contents

Notices ii
Restrictions and Liabilities ii
All Rights Reserved ii
Safety Considerations iii
Warnings and Cautions iv
Hazard Warnings iv
Precautions iv
Applicable Testing Standards v
Safety Requirements v
Electromagnetic Interference and Susceptibility v
EC Directive 89/336/EEC Electromagnetic Compatibility vi
Emissions vi
Immunity vi
EC Directive 73/23/EEC Low Voltage (User Safety) vi
Warranty vivii
About This Manual viii

Chapter 1: Overview 1-1

Introducing the INCU™ 1-2
INCU Measurements 1-3
Getting to Know the INCU 1-4
AAMI/IEC Standards 1-6
INCU Applications 1-6
Accessories 1-8

Chapter 2: Installation 2-1

Unpacking and Inspection 2-2
Connecting INCU 2-3
AC-DC Battery Charger Connection 2-3
Internal Battery 2-3
RS-232 Port 2-3
Air Flow Sensor 2-4
Radiant Baby Assembly 2-4
PC Software System Requirements 2-5
Installing the PC Software 2-6
Installing the Software 2-6

Chapter 3: General Operation 3-1

INCU Keypad Functions 3-2
Key Details 3-3
INCU Setup 3-5
Placement of the INCU in the Incubator 3-5
Infant Radiant Warmers 3-9
INCU Operation 3-10

Chapter 4: INCU PC Software Operation 4-1

Introduction 4-2
Configuring the INCU for Data Acquisition 4-2
Data Acquisition 4-4
Transferring Data to the PC Software 4-5
Graphs 4-7
Software Options 4-8
Open Files 4-8
Save Files 4-8
Printer Configuration 4-8
Print Folder 4-8
Cascade 4-9
Heading 4-10
Graph Colors 4-11
Com Port 4-12
Language 4-12
Zoom 4-13

Chapter 5: Safety, Displayed Messages, Troubleshooting, and Support 5-1

Electrical Safety 5-2
Cleaning 5-2
Air Flow Sensor 5-2
Displayed Messages 5-3
Troubleshooting 5-4
Support 5-6

Appendix A: Specifications A-1

Appendix B: Report Examples B-1

Appendix C: DAT File Format C-1

List of Illustrations

Figure 1-1. Closed Incubator With Forced Convection 1-3
Figure 1-2. Infant Warmer 1-3
Figure 1-3. Descriptions and Locations of INCU Sensors 1-4
Figure 1-4. View of Right Side of INCU 1-5
Figure 1-5. View of Left Side of INCU 1-5
Figure 2-1. Radiant Baby Assembly 2-4
Figure 2-2. INCU Setup Screen 2-6
Figure 3-1. The INCU Front Panel 3-2
Figure 3-2. INCU Keypad Display 3-3
Figure 3-3. INCU Inside a Closed Incubator 3-5
Figure 3-4. Placement of Temperature Sensors T1-T3 3-6
Figure 3-5. Placement of Air Flow Sensor 3-7
Figure 3-6. Placement of Temperature Sensor T4 3-8
Figure 3-7. Placement of an INCU Inside an Infant Warmer 3-9
Figure 3-8. Placement of a Radiant Baby Adapter on Top of the INCU 3-9
Figure 3-9. Data Acquisition Mode Screen 3-11
Figure 4-1. PC Interconnected With the INCU 4-2
Figure 4-2. Using the Config Menu 4-3
Figure 4-3. INCU Keypad Display 4-4
Figure 4-4. INCU File Transfer Menu 4-5
Figure 4-5. INCU Comments Entry Window 4-6
Figure 4-6. INCU Parameter Options Menu 4-7
Figure 4-7. INCU Parameter Screen 4-7
Figure 4-8. INCU File Menu Screen 4-8
Figure 4-9. INCU Window Menu Screen 4-9
Figure 4-10. INCU Parameters Menu Screen 4-9
Figure 4-11. INCU Heading Screen 4-10
Figure 4-12. INCU Graph Colors Screen 4-11
Figure 4-13. INCU Communication Menu Screen 4-12
Figure 4-14. INCU Language Menu Screen 4-12
Figure 4-15. INCU Zoom Menu Screen 4-13
Figure 4-16. INCU Zoom on Window Screen 4-13
Figure B-1. Sample Monitoring Sheet B-3
Figure B-2. Sample History Graph Sheet B-4
Figure B-3. Sample Parameter Numerical List B-5

Chapter 1: Overview

1

Inside This Chapter

- Introducing INCU™
- INCU™ Measurements
- Getting to Know INCU™
- AAMI/IEC Standards
- Accessories

Introducing INCU™

The INCU Incubator Analyzer is a portable device designed to verify the proper operation and environment of infant incubators. This unit records parameters important to the care of infants over time, such as airflow, sound level, temperature (four individual measurement probes), and relative humidity. Event markers can be placed on the recording to identify certain activities or periods. The rechargeable battery allows the unit to be placed within the incubator chamber for up to 24 hours without compromising the integrity of the environment.

The INCU can operate stand-alone or with the use of a personal computer. With a PC, the user selects the desired record time/interval via the software, and then initiates the start of the test from the INCU. After completion of the test, the user uploads the data collected by INCU into the PC software for display and analysis. The user may store the recorded data in a file or print the data to a report. In stand-alone mode, the unit displays all measured parameters repeatedly in cycle fashion, and no data is recorded.

Features on the INCU include:

- **Portability:** Sits in place of the infant within the incubator.
- **Multiple Sensors:** Measures and documents multiple key infant incubator parameters simultaneously.
- **Compliance:** Measures most parameters according to IEC and AAMI standards.
- **Efficient:** Saves time in testing critical infant incubators.
- **Data Collection:** Uses Microsoft® Windows® software for evaluation and documentation.
- **Reporting:** Allows printing of numerical and graphical reports.
- **Recording Flexibility:** Provides adjustable measurement intervals.
- **Two Modes of Operation:** Operates stand-alone or fully functioning, requiring a computer.

INCU is to be used by service personnel or Biomedical institutions to verify and test infant incubators. INCU is designed to support testing of two types of incubators, as shown in *Figures 1-1* and *1-2*.

Figure 1-1. Closed incubator with forced convection

Figure 1-2. Infant warmer

INCU Measurements

INCU is an autonomous acquisition system that is used to measure and save the operational parameters of an empty incubator, and then transmit data via a serial communications port. INCU provides, in a single unit, the measurement systems that allow you to record the multiple parameters simultaneously.

The following measurement parameters are recorded:

Temperature – 4 Sensors T1-T4
Relative Humidity – 1 Sensor
Air Flow – 1 Sensor
Sound – 1 Sensor

See *Appendix A, Specifications* for performance specifications.

Getting to Know the INCU

Sensors are integrated and stored within INCU. Open INCU by releasing the latch on the top cover. Fold the covers open to expose the sensors when taking measurements. *Figure 1-3* shows the location of each sensor.

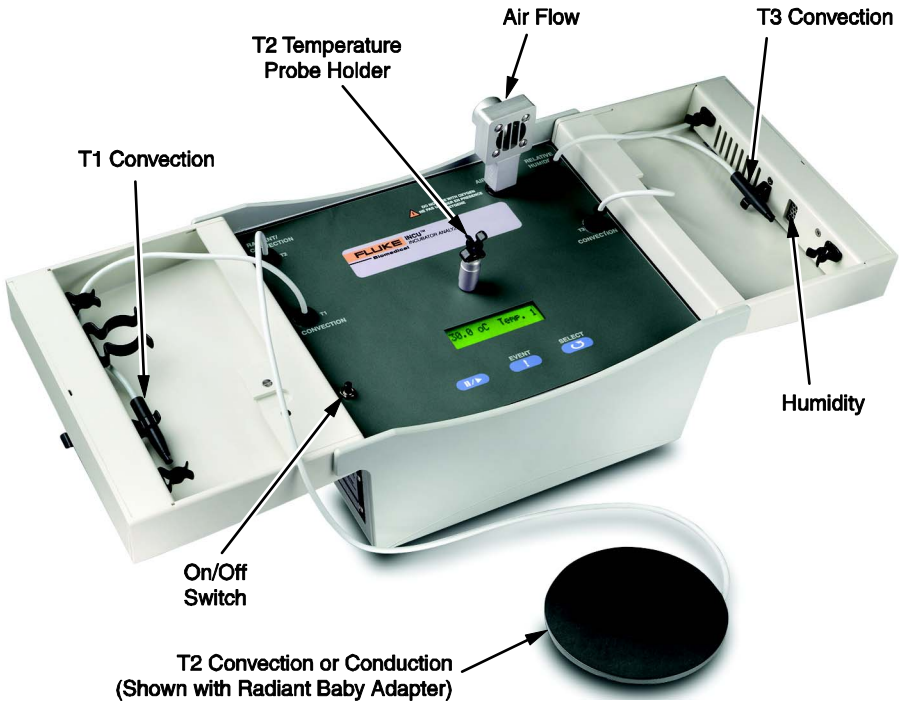


Figure 1-3. INCU sensors

- **Temperature Sensor T1:** Used for Convection measurements.
- **Temperature Sensor T2:** Used for Convection or Radiant measurements; used with radiant baby adapter supplied with INCU.
- **Temperature Sensor T3:** Used for Convection measurements.
- **Relative Humidity:** Located in right top cover (cover must be open for proper measurements).
- **Air Flow:** Detachable for storage.
- **ON/OFF Switch:** Top cover engages this switch to turn power off to INCU automatically, if the master On/Off switch is left in the ON position and the top covers are closed (master switch is on the left side of the exterior).
- **Temperature Probe Holder:** Used to hold temperature probe T2 when taking convection measurements. This is a mechanical connection only; there is no electrical connection.

Figure 1-4. View of right side of INCU

- **Sound Sensor:** Internal Microphone used for sound measurements.
- **Temperature Sensor T4:** Used for Mattress Temperature Measurements, made by conduction.

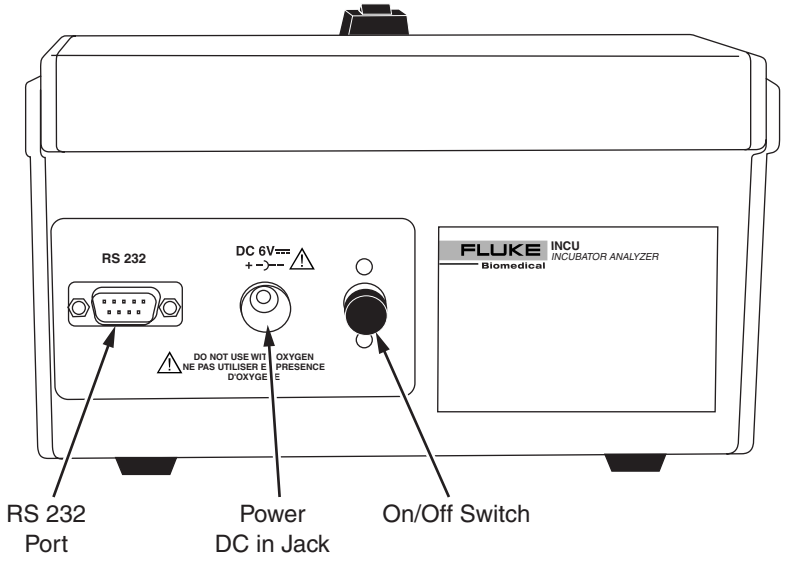


Figure 1-5. View of left side of INCU

- **RS-232 Port:** 9 Pin D Sub type Male Connector.
- **Power DC IN Jack:** Use only the specified charger. AC-DC 6V 600 mA.
- **Master On/Off Switch:** Push for **OFF** or **ON**.

AAMI/IEC Standards

The AAMI and IEC standards specify sound levels, CO_2 concentration, and thermal characteristics for incubators. The standards are used by manufacturers when designing and manufacturing incubators. INCU was designed with consideration of the standards, and can perform testing to satisfy many testing requirements.

Incubator Standards	
Standard#	**Description**
IEC 601-2-19	Infant Incubator Tester Safety Requirements
IEC 601-2-20	Safety Requirements for Transport Incubators
IEC 601-2-21	Infant Radiant Warmer Standard
ANSI/AAMI 1136-1997	Infant Incubators

Note: For up-to-date standards, please visit AAMI.org or IEC.org.

Note: The following are examples of standards for description proposed. Please reference the current application to determine your testing protocol.

INCU Applications

The following section provides information describing how INCU can be used to perform testing in consideration of the standards.

1. **Temperature – *Standard:*** During steady state condition, the INCUBATOR TEMPERATURE shall not differ from the AVERAGE INCUBATOR TEMPERATURE by more than 0.5°C (1°C transportable) during at least 1 hour at the control temperatures of 32°C and 36°C.

   INCU: The user shall check the oscillation from min to max in steady state.

2. **Temperature - *Standard:*** The AVERAGE TEMPERATURE in each point A,B,C,D,E, shall not differ from the AVERAGE INCUBATOR TEMPERATURE (test at a set T of 32°C - 36°C) by more than ±0.8°C (±1.5°C transportable).

   INCU: In any position of the tilted mattress, it shall not differ by more than ±1.0°C (±2.0°C transportable). Calculate manually the difference between the mean value at the center and the other sensors readings.

3. **Temperature - *Standard:*** The TEMPERATURE as measured by the skin temperature sensor shall not differ from a reference sensor temperature by more than 0.3°C in steady temperature condition.

   INCU: Check the difference between the value given by the T2 sensor and the value displayed by the skin sensor when placed in close proximity to the T2 sensor.

4. **Temperature - *Standard:*** The INCUBATOR shall be provided with an indicator of the internal temperature. The mean value of the reading of this device shall not differ from the average incubator temperature measured by a standard thermometer by more than ±0.8°C (±1°C transportable), less the standard thermometer error. The standard thermometer shall be accurate within ±0.05°C.

   INCU: Check the difference between the value of the mean value at the center and the one displayed by the indicator.

5. **Temperature - *Standard:*** Working as an air-controlled INCUBATOR, the average INCUBATOR TEMPERATURE shall not differ from the control temperature by more than ±1.5°C (±2°C transportable).

   INCU: Check the difference between the value of the mean value at the center and the set value.

6. **Temperature - *Standard:*** The warm-up time of the equipment shall not differ by more than 20% from the warm-up time specified in the instructions for use.

   INCU: Check the difference between the time stated by the manufacturer and the time to raise the temperature by 11 C, starting at the environmental conditions with a setting temperature 12°C above the ambient.

7. **Temperature - *Standard:*** After adjusting the temperature from 30°C to 34°C or Transit 32°C to 36°C, the overshoot in the incubator temperature shall not exceed 2°C.

   INCU: Calculate the overshoot manually.

8. **Standard:** Any indicated value of relative humidity shall have an accuracy of ±10% (±15% transportable) of the actual measured value.

   INCU: Read the value and compare it with the set value.

9. **Sound Pressure - *Standard:*** In normal use, the sound level within the baby compartment shall not exceed 60 dB except as specified in 102.2.

   INCU: Read the value and compare it with the threshold.

10. **Sound Pressure - *Standard:*** When any incubator alarm is sounding, the sound level within the baby compartment shall not exceed 80 dB.

    INCU: Activate an alarm, read the value, and compare it with the threshold.

11. **Sound Pressure - *Standard:*** Audible alarms shall have a sound level of at least 80 dB at a distance of 3 m perpendicular to the front of the control unit.

    INCU: Activate an alarm, move the INCU outside, read the value, and compare it with the threshold.

12. **Air Flow – Standard:** In normal use, air velocity over the mattress shall not exceed 0.35 m/s.

    INCU: Read the value and compare it with the threshold.

Accessories

The following accessories are available for your INCU Incubator Analyzer.

Description	Part No.
DB9 Serial Cable	2238834
Transport Bag	2248900
Radiant Baby Assembly	2239002
Outside Temperature Probe Holder	2213928
Service Manual	2206983

Chapter 2: Installation

2

Inside This Chapter

- Unpacking and Inspection
- Connecting INCU™
- PC Software System Requirements
- Installing the PC Software

Unpacking and Inspection

Before unpacking the INCU, visually inspect the shipping box for damage.

If no damage is evident, unpack the INCU and use the checklist below to ensure that you have received the instrument accessories. Save the foam inserts and shipping box. You must use the original packing materials when shipping the INCU for service or re-calibration. If the original shipping carton and packing materials are not available, call a Fluke service representative for assistance.

If the shipping box is damaged, unpack the analyzer and inspect it for visible defects.

If the instrument is damaged, notify the carrier and your local dealer or service center. Keep the shipping cartons and packing materials for the carrier's inspection. Call a Fluke service representative to arrange for repair or replacement of your instrument without waiting for the claim against the carrier to be settled.

After unpacking the INCU, use the following checklist to ensure that you have received everything. In addition to the analyzer and this manual (P/N 3901000), you should have the following:

- A Transport Bag, P/N 2248900
- An Air Flow Sensor, P/N 2239025
- PC Software CD ROM, P/N 2213919
- AC Battery Charger with Country Adapters for the USA, Europe, Australia, or the UK, P/N 2213937
- 9-Pin to 9-Pin Serial Cable, P/N 2238834
- Temperature Probe Holder, P/N 2213928
- Radiant Baby Assembly, P/N 2239002
- Certificate of Calibration
- Declaration of Conformity
- Fluke Biomedical Warranty Card Information

Connecting INCU

AC-DC Battery Charger Connection

The INCU can operate either on its internal battery or with AC power.

Connect the specified adapter to the INCU DC jack on the side of the unit. Plug the opposite end into the AC power source. The universal charger can be plugged into AC power sources ranging from 90 VAC to 240 VAC, 50/60 Hz. Use the charger to recharge the internal batteries when a "low battery" warning is displayed. Regular charging of the battery will increase its life.

Warning: To reduce the risk of damage to the battery and to the INCU, only use the specified Fluke Biomedical Charger, P/N 2213937, AC-DC 8V 800 mA. Failure to do so will void the warranty.

Internal Battery

The system is equipped with a lead-acid battery, giving a maximum of 24 hours of operation. Use the AC Charger if recording parameters for longer than 24-hour periods.

RS-232 Port

Connect the INCU RS 232 port to an available COM port on the PC using the supplied 9-pin to 9-pin serial cable.

Air Flow Sensor

Plug the Air Flow Sensor into the jack on top of the INCU where it is labeled "Air Flow." Ensure that the Air Flow Sensor is installed before attempting to use the INCU. Otherwise, a “Sensor Fault” condition will result, indicating the absence of this sensor. To bypass the “ Fault sensor : 6” message, press any key. INCU operation will continue with normal operation with the exception of recording Air Flow parameters. Results will be displayed as 9.99 m/s.

The Air Flow Sensor is calibrated for each INCU unit. If the Air Flow Sensor is lost or damaged, the unit must be returned for service. See "*Support"* in *Chapter 5, Safety, Displayed Messages, Troubleshooting, and Support.*

Warning! Do not use in the presence of oxygen! The Air Flow Sensor uses a hot-wire technology that can be a source of ignition if used in oxygen-enriched environments. INCU should not be used in conditions where oxygen levels are greater than ambient.

Radiant Baby Assembly

Figure 2-1 shows the radiant baby assembly.

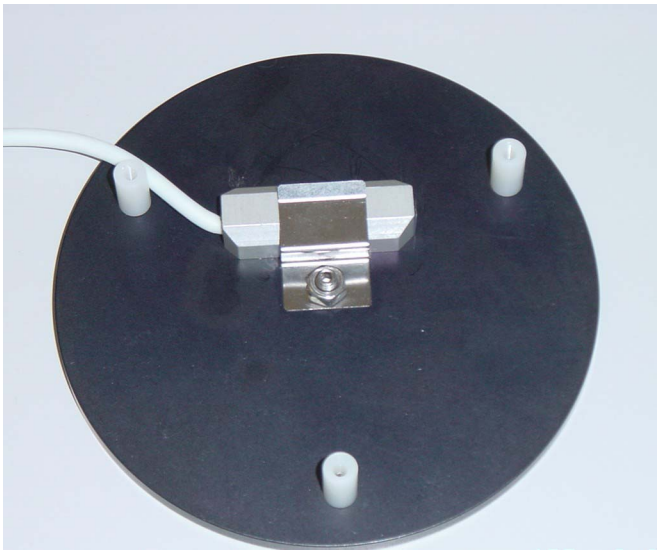


Figure 2-1. Radiant baby assembly

PC Software System Requirements

To utilize the full capabilities of your INCU program, the following ***minimum*** environment is required:

A PC or portable computer equipped with:

- Pentium 133 MHz microprocessor
- 16 MB free hard disk space
- SVGA color monitor
- Serial port COM 1-4 (one com port available)
- Mouse compatible with Microsoft® operating system
- 1 CD ROM disk drive
- Microsoft® Windows® 95B, Windows® 98, Windows NT® 4.0, or Windows® 2000 operating system
- A laser or inkjet printer

Note: Microsoft® Windows® 3.0 and Windows® 3.1 for Workgroup 3.11 are not supported by this application.

Note: Certain portable computers are equipped with an infrared serial communications port. The presence of such a port, typically COM 2, may create operating difficulties on the COM 1 serial port. In this case, delete the infrared COM 2 port from the peripheral driver.

Installing the PC Software

Installing the Software

The INCU PC Software is provided with both French and English installation instructions. If desired, the language for the PC Software may be selected after installation.

1. Insert the INCU PC Software for Windows® CD ROM into the CD ROM drive on your PC. Under Microsoft® Windows® 95/98/NT, select **Run** from the **Start** menu.

   For ***English***, when the **Run** dialog box is displayed, type in **d:\incugb\setup.exe**. If your disk drive is not "D", then substitute the correct drive letter. Click **OK**.

   For ***French***, when the **Run** dialog box is displayed, type in **d:\incufr\setup.exe**. If your disk drive is not “D”, then substitute the correct drive letter. Click **OK**.

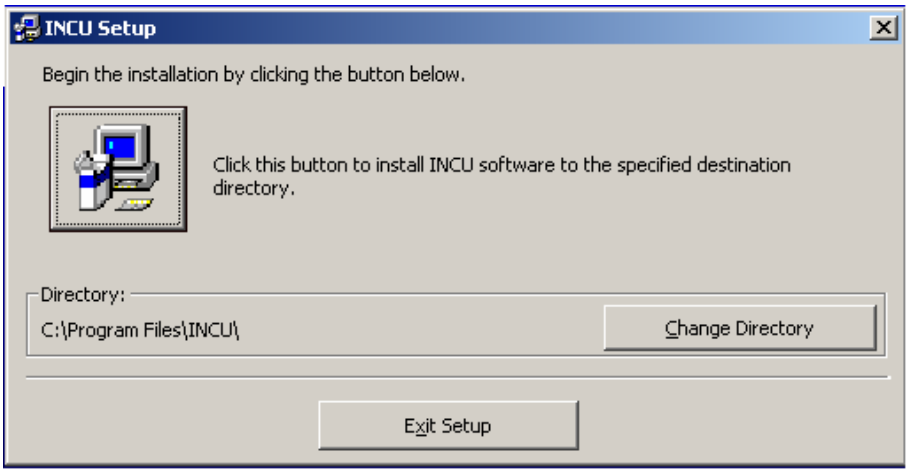

INCU Setup
Begin the installation by clicking the button below.
Click this button to install INCU software to the specified destination directory.
Directory:
C:\Program Files\INCU\
Change Directory
Exit Setup

Figure 2-2. INCU setup screen

2. To exit the installation program, click on **Exit Setup**.
3. As shown in Figure 2-2, click on **Change Directory** to select a location on your computer in which the program will be installed.
4. Simply follow the instructions given by the installation program. If no changes are made to the default installation options, INCU PC Software will be installed to **C:\Program Files\INCU**, and the shortcuts to the program will be in the INCU group.
5. To start the program, double-click on the INCU icon.

Chapter 3: General Operation

3

Inside This Chapter

- INCU Keypad Functions
- INCU Setup
- INCU Operation

INCU Keypad Functions

Figure 3-1 illustrates the INCU keypad. The keys and their functions are described on the following pages.

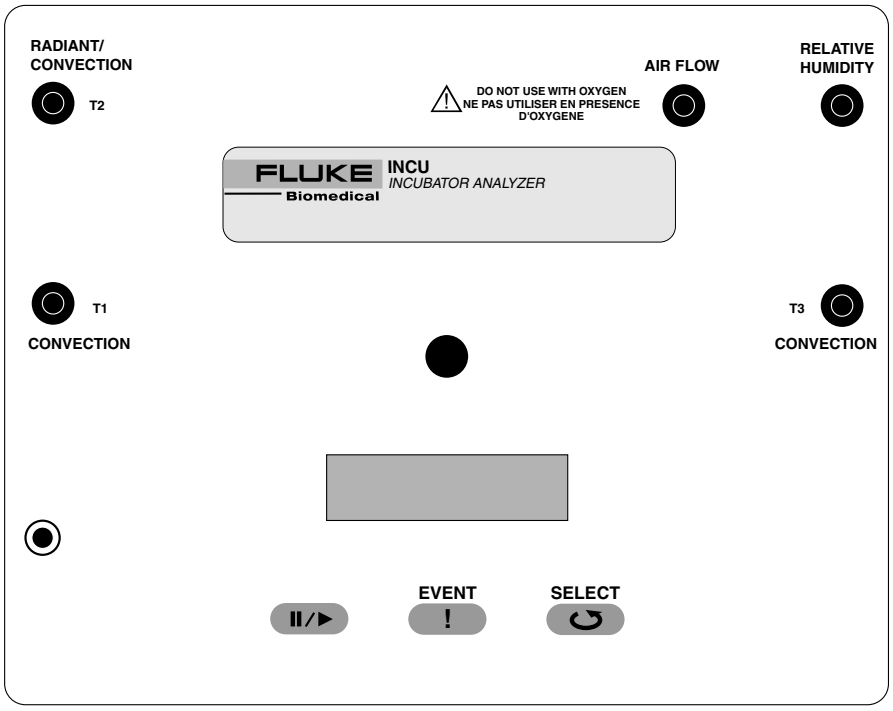
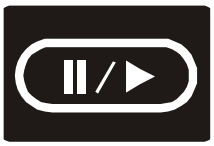


Figure 3-1. The INCU front panel

Key Details



Start/Pause Key

1. Press this key for approximately 1 second to begin recording. This function is only active once the INCU has been connected to a PC and a measurement cycle has been initialized.
2. A second display line appears (see *Figure 3-2*) with the following information:
   - Measurements that have already elapsed
   - Total measurements
   - The number of events recorded (maximum 5).

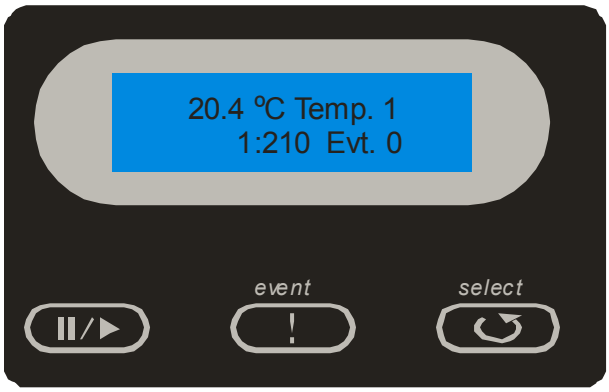


Figure 3-2. INCU keypad display

3. The sensor number that is displayed flashes to indicate that the measured values have been recorded.
4. Press this key a second time to pause (to allow time for adjustment, for example). During this pause phase, the channel number stops flashing.
5. Press this key a third time to resume recording. There is no limit to the number of interruptions possible.

Event Key

Press this key for approximately 1 second to mark a particular value or a pause in the recording sequence. As a result, the action is recorded and then displayed on the History Graph Sheet and Parameter Numerical List (see *Appendix B, Report Examples)*.

For an explanation of the significance of each marker, see *"Transfer Data to the PC Software"* in *Chapter 4, INCU PC Software Operation.*

Note: It is possible to store 5 events. The stored events cannot be deleted.

Sensor Key

1. First mode:
   - Each time this key is pressed for approximately 1 second, the next sensor is displayed (one of the 7 currently active sensors, in order).
2. Second mode:
   - Pressing this key two times quickly allows you to scroll through the channels. Press the key a third time to freeze the display.

INCU Setup

Placement of the INCU in the Incubator

With both covers open and fully extended, the INCU has dimensions (length and width) similar to those of a typical infant (non-preemie). The INCU should therefore be placed in an isolette (incubator), or infant warmer in the same manner as an infant would be positioned for normal operation; i.e., centered on the mattress ensuring that air circulation vents, temperature probes, etc. are not blocked or impinged. *Figure 3-3* shows the INCU inside a closed incubator.

Closed Incubators

Figure 3-3. INCU inside a closed incubator

T1, T2, and T3 Convection Sensors: *Figure 3-4* shows the recommended placement for temperature sensors T1-T3 for closed incubators utilizing forced convection. With the sensors mounted to the provided clips, temperature accuracy, response, and uniformity can be monitored throughout the area occupied by the infant at the height of approximately 10 cm above the mattress as specified by standards. In this case, T2 is being utilized as a convection temperature sensor.

Humidity Sensor (Fixed): The humidity sensor is fixed and is located on the inside of the right-hand cover as shown in *Figure 3-4*.

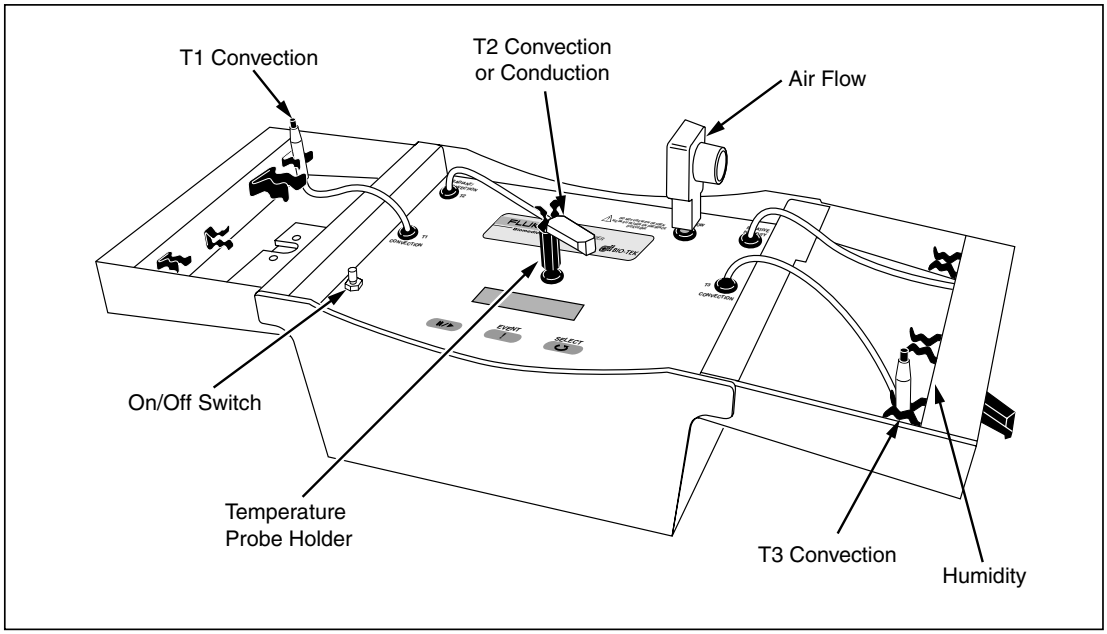


Figure 3-4. Placement of temperature sensors T1-T3

Note: To achieve a better temperature slew rate, for T1, T2, it is preferable to clip on the sensor cable instead of the body sensor.

Air Flow Sensor: The Air Flow Sensor is detachable; however, it must be inserted to perform measurements. An error "fault sensor" will be displaced if not inserted or if the Hot Wire is broken in the sensor. The INCU will not perform airflow measurements in this condition.

The Air Flow Sensor (*Figure 3-5*) rotates 360 degrees. For best results, position the Air Flow Sensor perpendicular to the airflow within the incubator. Incubators utilize different airflow patterns; thus, the user needs to be familiar with the particular airflow pattern utilized by the incubator under test to properly position the Air Flow Sensor.

Figure 3-5. Placement of Air Flow Sensor

Warning! Do not use in the presence of oxygen! The Air Flow Sensor should **not** be used in an oxygen-enriched environment. The Air Flow Sensor utilizes a hot-wire technique, which can be a source of ignition.

T4 Conduction Sensor: As shown in *Figure 3-6*, the T4 conduction sensor is fixed and is located on the bottom of the INCU. T4 provides the temperature of the mattress.

Sound Sensor (Fixed): The sound sensor is fixed and is located on the right side of the INCU.

Figure 3-6. Placement of temperature sensor T4

Infant Radiant Warmers

INCU sensor placement for testing infant radiant warmers is treated in the same manner as closed incubators utilizing forced convection, with the exception of T2. As discussed above, T2 is used as a third convection temperature sensor for testing closed incubators with forced convection. In contrast, when testing infant radiant warmers, T2 is utilized as a radiant temperature sensor.

For testing infant radiant warmers, T2 is clipped to the underside of the **radiant baby adapter** that is provided. The **radiant baby adapter** is a stand-alone circular-shaped piece that simulates the absorption properties of an infant. This adapter must be placed on top of the INCU when testing. Align the adapter with the heater in the warmer.

Other temperature sensors (T1, T3) may be used to monitor ambient temperature conditions.

Figure 3-7 shows the placement of the INCU in an infant warmer. *Figure 3-8* shows the placement of a radiant baby adapter on top of the INCU.

Figure 3-7. Placement of an INCU inside an infant warmer

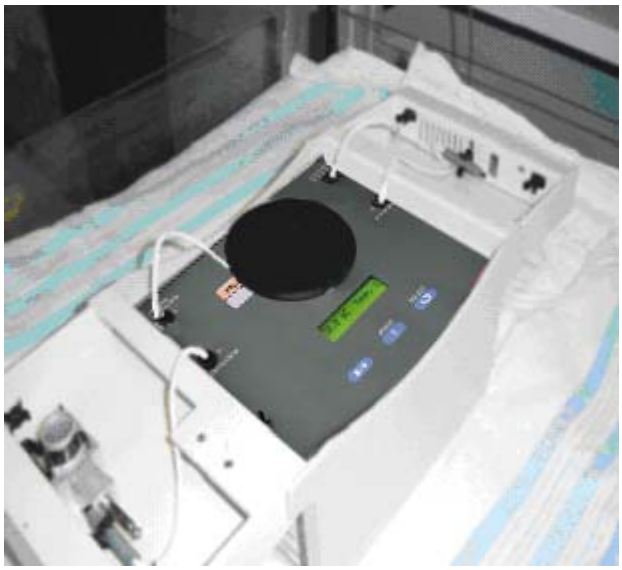


Figure 3-8. Placement of a radiant baby adapter on top of the INCU

INCU Operation

1. **Place the INCU into position within the incubator or infant warmer.**

   Refer to *Figures 3-3* and *3-7* for placement of the INCU.

2. **Place the sensors into position.**

   Place temperature sensors T1, T2, and T3 into position, and connect the Air Flow Sensor.

   To conduct a test on an infant warmer, clip the end of probe T2 under the **radiant baby adapter** as shown in *Figure 2-1*.

3. **Turn on the power.**

   If acquiring data for periods longer than 24 hours, use the AC Charger.

   Open both covers to expose the INCU panel and display. Push the On/Off switch located on the left-hand-side panel of INCU to turn on the INCU.

Note: The INCU is equipped with a secondary On/Off switch on the top panel. This is a safety switch used to prevent INCU power from remaining on when the covers are closed.

Caution: Pressing the On/Off switch located on the top panel during data acquisition will initialize the INCU and stop the data acquisition session.

The unit will display the following:

Line 1: **INCU. ANALYZER**

Line 2: **Ver : 3.00**

followed by:

Line 1: **Self Testing**

If error conditions are present, the unit will display an error.

For detailed error condition information, refer to *Chapter 5, Safety, Displayed Messages, Troubleshooting, and Support*.

4. Obtain Readings

The unit is now ready either to be used as a measuring device in manual mode, or in an automated data acquisition mode as configured by the PC software. For further information on configuring INCU for data acquisition, refer to *Chapter 4, INCU PC Software Operation.*

5. Observe Readings – Manual Mode

Sensor data is displayed on the first line. To manually cycle through the available sensors, press the **Select** key. If the **Select** key is pressed too quickly and then released, the INCU will cycle through and display each of the available sensor channels automatically. To revert to manual mode, press the **Select** key again. No data is stored within the INCU in this mode. The INCU must be configured for using the PC software prior to starting any automated data acquisition.

6. Data Acquisition Mode Using the PC Software

After being configured for data acquisition, the INCU will display **Ready**. Press the **Pause/Play** key to begin data acquisition.

The second line of the display shows the following (*Figure 3-9*):

- Measurement samples already recorded
- Total samples
- The number of events memorized (maximum 5)

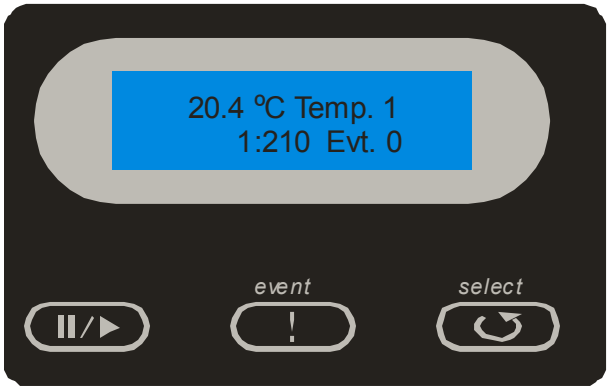


Figure 3-9. Data acquisition mode screen

The sensor channel number on the display flashes, indicating that the measured values have been stored.

Press the **Pause/Play** key a second time to pause data acquisition (to allow time for adjustment, for example). During this pause phase, the channel number stops flashing.

To resume data acquisition, press the **Pause/Play** key again. There is no limit to the number of interruptions possible.

Chapter 4: INCU PC Software Operation

4

Inside This Chapter

- Introduction
- Configuring the INCU for Data Acquisition
- INCU Data Acquisition
- Transferring Data to the PC Software
- Graphs
- Software Options

Introduction

The full capability of the INCU is realized when used in conjunction with the provided PC application.

The provided PC software for INCU is used to:

- Select the measurement interval (1-10) minutes
- Select the total recording period (35 hours max)
- Display recorded data in graphical form
- Print a provisional monitoring sheet
- Create backup files that can be used by a spreadsheet program such as Microsoft® Excel.

Configuring the INCU for Data Acquisition

1. Connect all sensors
2. Press the On/Off button for approximately one second.
3. Wait until the INCU has completed the initialization sequence.
4. Using the supplied RS-232 cable, connect the INCU to a PC that is loaded with the INCU PC software as shown below.
5. Double-click on the installed icon to start the INCU PC software.

Figure 4-1 shows an example of a PC interconnected with an INCU.

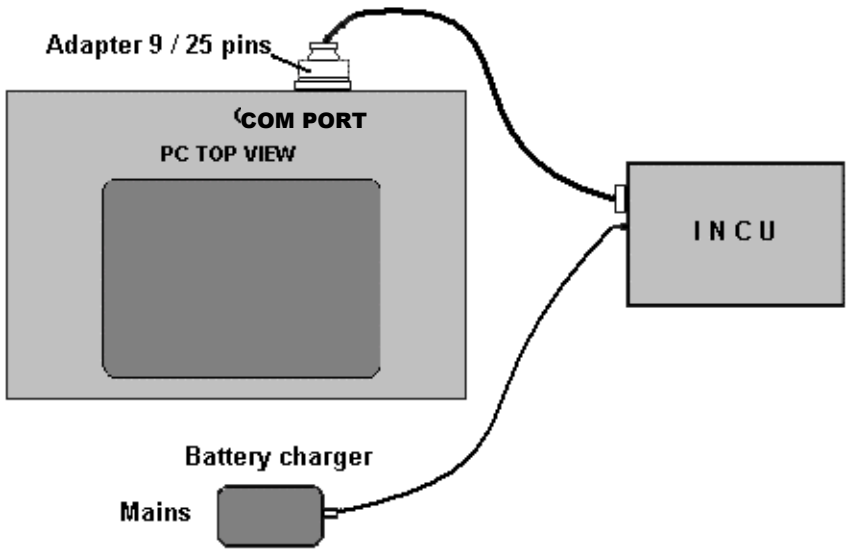


Figure 4-1. PC interconnected with the INCU

6. Once the PC program is up and running, select the **Connect** command and then **Config**.

   The **Config** command is used to select the measurement interval and total recording period, and to document the serial number of the incubator under test as shown in *Figure 4-2*.

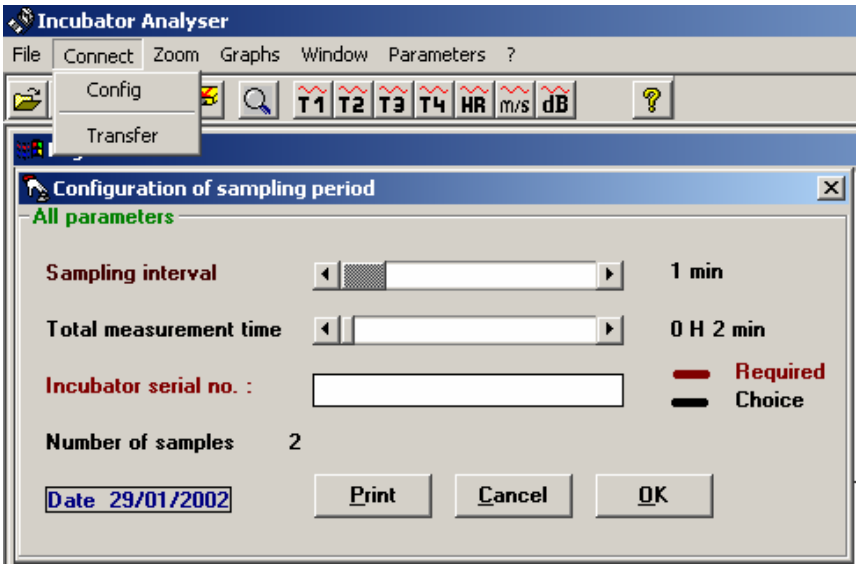


Figure 4-2. Using the Config menu

7. To select the measurement interval, click on the scrolling arrows located next to **Sampling interval**. You can choose from 1 minute up to 10 minutes in one-minute intervals.

   The measurement interval specifies how often the sensors are sampled for data. That is, if the measurement interval is one minute, all seven INCU sensors are then polled every minute and the results are recorded.

8. To select the recording period, click on the scrolling arrows located next to **Total measurement time.** You can choose up to 35 hours for the recording period (with a 10-minute sampling period).

   The recording period specifies the duration of the test. That is, if the measurement interval is one minute and the recording period is set for one hour, the test will last for one hour, and during that time, 60 measurements for each sensor will be recorded. The maximum measurement capacity of the INCU is 1470 (210 records x 7 parameters).

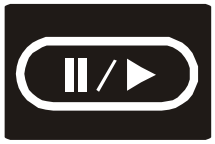
9. Enter the serial number for the incubator under test in the field next to **Incubator serial no.**

   Note: You **must** enter a serial number in this field to proceed.

10. From the **File** menu, choose **Print** to print out a **monitoring sheet** (see *Figure B-1* in *Appendix B, Report Examples*). This sheet contains the INCU configuration information along with fields for manufacturer, type, department, etc. Use the **monitoring sheet** to record events that occur during the incubator-testing phase.

Data Acquisition

After the INCU is configured for data acquisition, **Ready** will be displayed. Disconnect the INCU from the PC and place it into an incubator or infant radiant warmer under test as described in *Chapter 3*. When properly configured and positioned, the INCU is ready for data acquisition.



Start/Pause Key

1. Press this key for approximately 1 second to begin recording. This function is only active once the INCU has been connected to a PC and a measurement cycle has been initialized.
2. A second display line appears (see *Figure 4-3*) with the following information:
    - Measurements that have already elapsed
    - Total measurements
    - The number of events recorded (maximum 5).

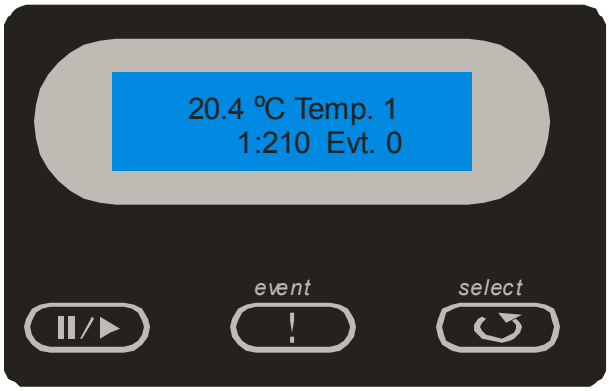


Figure 4-3. INCU keypad display

3. The sensor number that is displayed flashes to indicate that the measured values have been recorded.
4. Press this key a second time to pause (to allow time for adjustment, for example). During this pause phase, the channel number stops flashing.
5. Press this key a third time to resume recording. There is no limit to the number of interruptions possible.

6. Press the **Events** key for approximately 1 second to mark a particular value or a pause in the recording sequence. As a result, the action is recorded and then displayed on the History Graph Sheet and Parameter Numerical List (see *Figures B-2* and *B-3* in *Appendix B, Report Examples)*.
7. Describe these events on the **monitoring sheet** if one was printed before data acquisition. It is possible to record up to five events.

When the acquisition phase is complete, **end of measurements** will be displayed.

Transferring Data to the PC Software

After data acquisition is complete, data transfer can be executed. Data transfer is the act of transferring the data in the INCU from the previous acquisition to a PC running INCU PC software. When data is transferred to a PC, it can be displayed in graphical or numerical form, and/or saved as a file for future reference (see *Appendix B* for examples of graphs and numerical data). Numerical data can be entered into Microsoft® Excel or some other spreadsheet program to customize your own graphs.

To initiate a data transfer from the INCU**,** connect the INCU to a PC running the INCU PC software via the RS-232 port utilizing the supplied RS-232 cable. Click on connect and transfer as shown in *Figure 4-4* to initiate data transfer. During the transfer phase, the mouse pointer indicates the progress of data transfer.

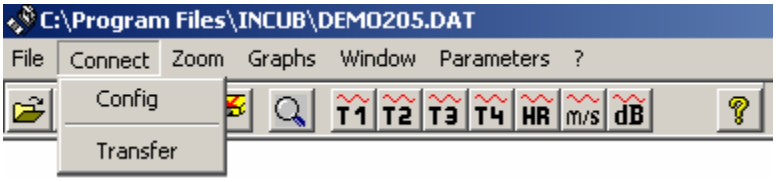


Figure 4-4. INCU file transfer menu

At the end of transmission, the comments entry window appears as shown below. This window allows you to enter comments for or update the **monitoring sheet**.

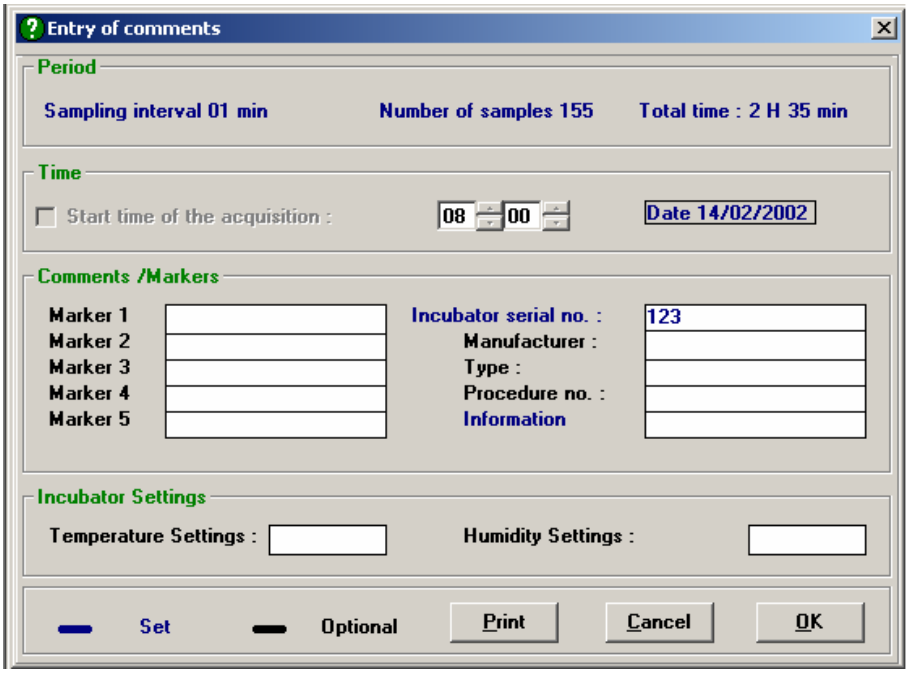


Figure 4-5. INCU comments entry window

At download the user can enter either the start or end of time of the acquisition by clicking on the checkbox. Use the two scrollbars to specify the hour and the minutes. If **Start time of the acquisition:** is not checked, the PC software defaults to **end of acquisition time**.

The PC software will calculate the **start time** based on the sample interval selected and the **end of acquisition time** entry.

Graphs

This menu is accessible after the recorded data has been loaded. When the graph menu option is selected, four parameters are displayed.

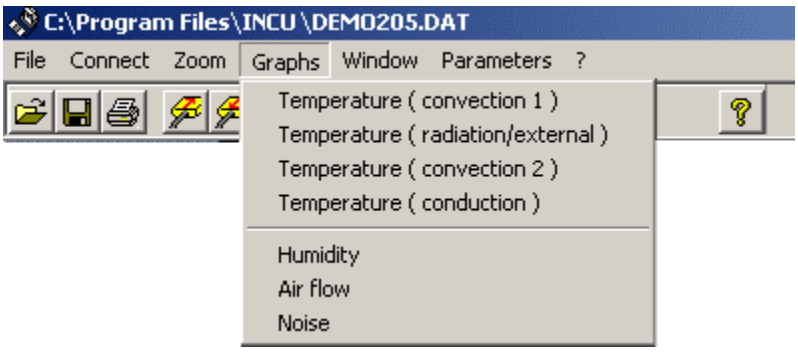


Figure 4-6. INCU parameter options menu

When a parameter is selected, a window is displayed presenting data in graphical form (see *Appendix B* for examples of graphs). The upper section of the window is shown in *Figure 4-7*.

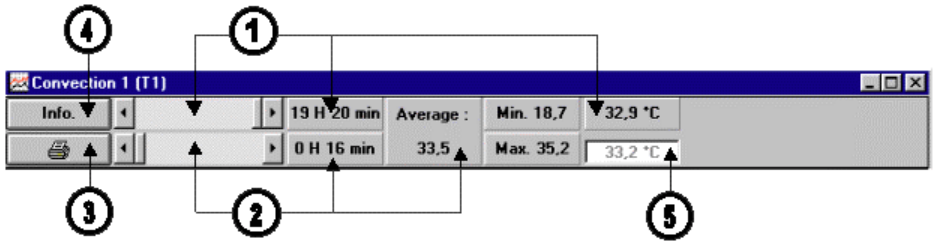


Figure 4-7. INCU parameter screen

1. **First Scrolling Bar:** Selects the specific time during the acquisition period in hours and minutes. The associated dialogue box shows the value of the data item for the time selected.

2. **Second Scrolling Bar:** Selects the time interval for calculating an average for the data item. The average is based on the time specified by the first scrolling bar and is updated when the first scroll bar is adjusted (rolling average).

3. **Print Key:** Prints the graph displayed on a single page.

4. **INFO/Marker Key:** Loads the **Comments Window** associated with an event when an event marker is encountered by moving the **first scrolling bar**. The key is only active when an event is encountered.

5. This box shows the value of the data item selected by the mouse pointer.

Software Options

INCU PC **File** menu features shown in *Figure 4-8* are described below.

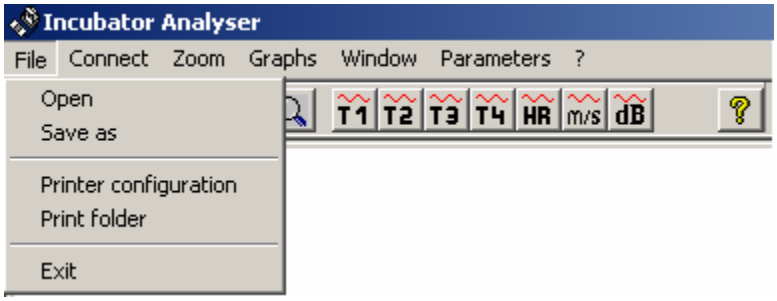


Figure 4-8. INCU File menu screen

Open Files

To open a document:

1. In the **File** name field, click on the drive containing the document.
2. In the area listing the folders and files, double-click on the name of the folder in which the document is stored
3. Double-click on each sub-folder in turn until you reach the sub-folder containing the document.

Save Files

To save a file:

1. In the **File** menu of the program you are working in, click on **Save**.
2. If you have not yet saved your file, type the name you wish to give it in the **File** name field.

Printer Configuration

This window enables you to access the different parameters of your printer. These functions are variable and depend on the type of printer used.

Print Folder

Click on **Print Folder** to print the recorded data including the **monitoring sheet**, the **history graph sheet**, and the **parameter numerical list** shown in *Appendix B*.

INCU PC **Window** menu features, including **Cascade**, **Horizontal tile**, and **Vertical tile**, are shown in *Figure 4-9* and are described below.

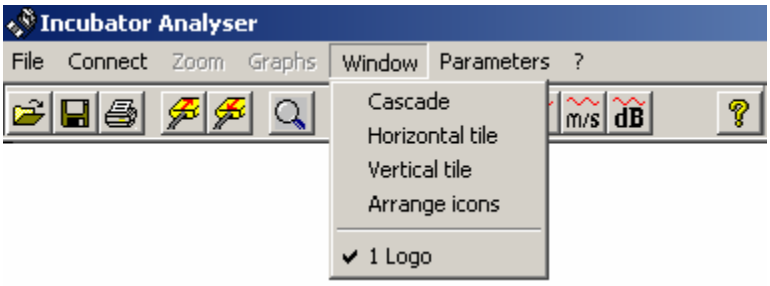


Figure 4-9. INCU Window menu screen

Cascade

To organize windows so that they overlap each other, click on the menu **Window**, then on **Cascade**. To position windows side by side without any overlap, click on the **Window** menu, and then click on **Vertical tile**. To position windows from top to bottom without any overlap, click on the **Window** menu, and then click on **Horizontal Tile**.

Figures 4-10 through *4-14* show the INCU PC **Parameters** menu features, described below.

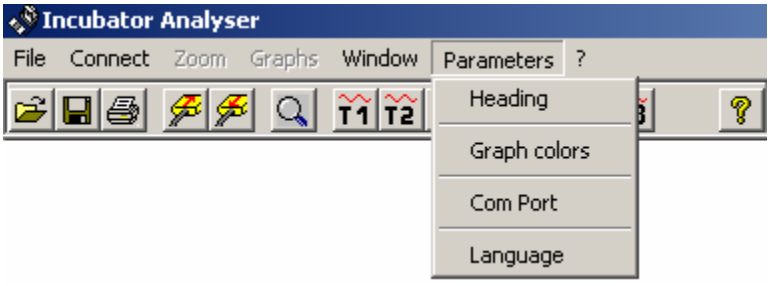


Figure 4-10. INCU Parameters menu screen

Heading

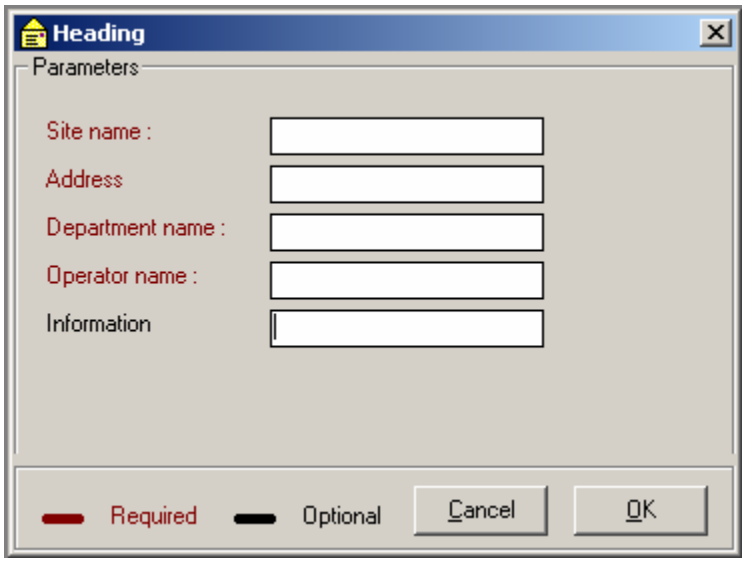


Figure 4-11. INCU Heading screen

This menu is used to customize the **monitoring sheet**. All fields shown in red must be completed when you enter this menu.

- Site name
- Address
- Department name
- Operator name

The only exception is the **Information** field, intended for customization of the **Comments** heading in the **Comments** entry window.

Graph Colors

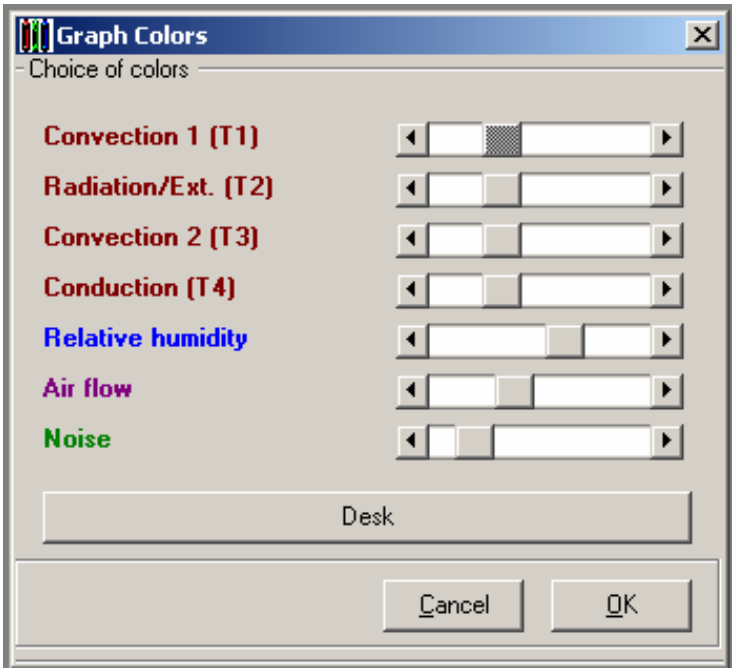


Figure 4-12. INCU Graph colors screen

Use this menu to apply the color of each graph from 15 available colors. The **Desk** key allows you to set the background color of the INCU window. When you exit the INCU program, your choices are automatically saved in the file **setup.cfg**.

Com Port

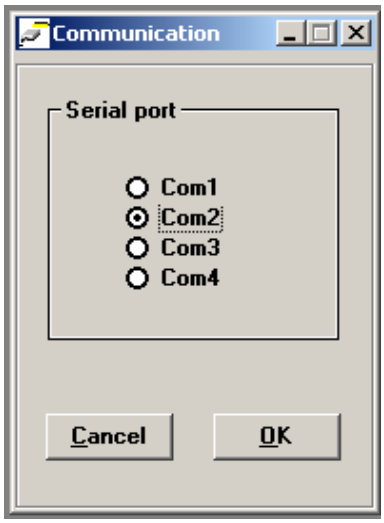


Figure 4-13. INCU Communication menu screen

This menu allows you to select the serial communications port (Com). Com2 port is the default. Select the Com1, 3,or 4 port as shown in *Figure 4-13*. When you exit the INCU program, your choices are saved in the file **setup.cfg.**

Language

Figure 4-14. INCU Language menu screen

This menu allows you to select the language by clicking on French or English text.

Zoom

The **Zoom** menu screen is shown in *Figures 4-15* and *4-16*. The **Zoom** command is only applicable when a graph is displayed.

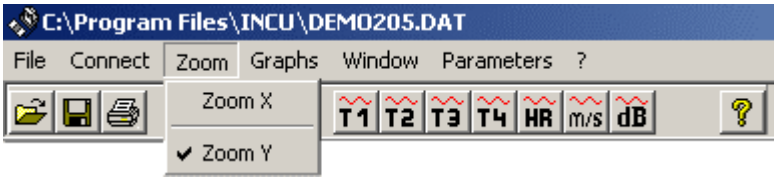


Figure 4-15. INCU Zoom menu screen

The **Zoom** menu applies only to the last graph activated. It consists of two elements:

1. Zoom X for the horizontal axis (x-coordinate: real-time scale on graphs)
2. Zoom Y for the vertical axis (y-coordinate).

Zoom X

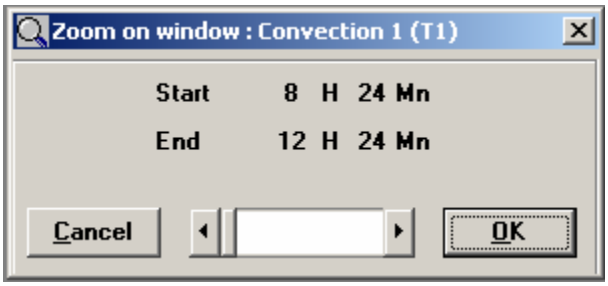


Figure 4-16. INCU Zoom on window screen

This command is active when a graph is displayed. It allows for inspection of a small interval of the total acquisition time. Maximum zoom is equal to 30 times the sample interval. When you close a graph, the zoom x menu becomes inactive.

Zoom Y

This is an optional command. It is used to define the Y-axis of the graph between the minimum value and the maximum value of the parameter at the time under observation.

If you wish to use the **Zoom** feature on an inactive graph, open the graph again through the Graph menu.

Chapter 5: Safety, Displayed Messages, Troubleshooting, and Support

5

Inside This Chapter

- Electrical Safety and Maintenance
- Displayed Messages
- Troubleshooting
- Support

Electrical Safety

Warning: For safe operation, use only the specified AC Charger with the INCU. Use of any charger other than that specified may result in a hazardous condition.

Cleaning

The system is to be cleaned with a damp cloth on the exterior only. A solution of 70% isopropyl alcohol may be used to remove stains and clean the system. No other solvents are recommended.

Air Flow Sensor

The Air Flow Sensor has been calibrated for use with each INCU. If an Air Flow Sensor is lost or misplaced, the unit must be returned to the factory or to a certified service center for recalibration. Failure to do so will result in invalid Air Flow readings.

Preventive Maintenance

Only authorized, qualified technicians should perform annual verification and calibration of the INCU unit according to the manufacturer's recommended procedures.

Displayed Messages

Possible INCU displayed messages are described below.

Displayed Message	Description
Self Testing	INCU is performing internal self-checks to determine proper operating condition before taking measurements. Any errors encountered during this test will be displayed on Line 1. Refer to *Chapter 5* for an explanation of possible error conditions from the INCU and possible cause and resolution.
Low Battery	The battery should be charged without delay. When the battery voltage is less than 5.35 volts DC, the message will be displayed. The battery voltage is displayed on power-up during the self-test routine. When the message appears, use the AC Charger for normal operation and/or to recharge the internal battery. When the internal battery voltage is greater than 5.85 volts DC, the message will not be present. **Note:** Regular charging of the battery increases its life considerably. The battery must never be completely discharged. **Note:** When this message appears, no data transfer between the INCU and the PC is possible. Use the AC charger. When the message disappears, data transfer is possible.
End of Measurements	Indicates that the data acquisition is complete. Connect the INCU to the PC to transfer data between the INCU and the PC. **Note***:* The recorded measurements can be retrieved using the PC even if the cycle has been interrupted before this message is displayed.
Data in Memory	The data transfer has not been completed. Using the PC Software, transfer the data to the PC. Data must be transferred to the PC in order to take further readings in memory.
Ready	Displayed after a new configuration has been sent from the PC software and stored in the INCU unit.
Fault Sensor	There is an error with the subject sensor. Refer to *Chapter 5* to determine corrective action for each respective sensor error.

Troubleshooting

Problem	Possible Cause	Corrective Action
INCU does not initialize when the top covers are opened.	Internal Battery Low	Recharge Battery or Connect AC Charger for operation.
	Master ON/OFF switch on side panel not turned on.	Push switch to turn the INCU on.
INCU does not communicate with the computer	RS-232 cable not plugged in.	Verify that the INCU is connected properly.
	Incorrect cable	Verify the cable used to connect the RS-232 is a straight-through cable. Null modem cables will not work properly.
	Correct COM port not selected	Select the COM port used via the PC Software – Tools menu.
	Operating system not supported.	The INCU PC Software requires 16550 UART. This is not present in earlier windows operating systems Windows 3.0, 3.1, and Workgroup for Windows 3.11. These operating systems are not supported. More information is available on this issue from the Microsoft website.
	INCU not initialized	Turn the analyzer off then on to reinitialize the unit.
Fault sensor: 1 to 4 during starting sequence	Problem with Temperature sensor	Return the INCU for service.
	The sensor temperature is out of the range (4°C to 70°C).	Allow the sensor to reach ambient room temperature, then reinitialize the unit by turning the power off then back on.
Fault sensor: 2	Sensor is connected to the **radiant baby assembly** prior to conducting the self-test.	Disconnect the T2 sensor from the **radiant baby assembly**. Allow the sensor to reach ambient room temperature, then, reinitialize the unit by turning the power off then back on.

Troubleshooting (Cont.)

Problem	Possible Cause	Corrective Action
Fault sensor: 6	Air Flow Sensor not plugged in.	Plug in Air Flow Sensor, or press any key to bypass the error condition. The INCU will perform all other measurements with the exception of Air Flow. All Air Flow readings will be displayed and stored as 9.99 m/s.
	Hot Wire broken in Air Flow Sensor	Replace Air Flow Sensor; unit must be sent back to Factory for recalibration.
INCU did not record all the measurements that it was configured for.	If the **low battery** message appeared while in the middle of data collection, then the INCU will stop the recording at that time.	Recharge the battery, or use the AC Charger. All data is stored in the INCU up to the point of the low battery message. Transfer the results to the PC using the PC Software program.
	The **stop** key was pressed prior to completion of the desired recording cycle.	All data is stored in the INCU up to the point of the low battery message. Transfer the results to the PC using the PC Software program.

Support

Troubleshooting

If your new INCU fails to operate successfully, call or e-mail Fluke's Service Department for assistance.

Service

Before returning the INCU for factory service, contact Fluke's Service Department for further information.

Phone: 888.993. 5853
Fax: 425.446.5560
Internet: www.flukebiomedical.com

Shipping Requirements

1. Pack the unit carefully. Enclose a completed Service Return Form.
2. Insure the unit for full retail value and ship to:

   Fluke Biomedical
   1420 – 75th Sreet SW
   Everett, WA 98203
   USA

Appendix A: Performance Specifications

Inside This Appendix

- Performance Specifications

Performance Specifications

This appendix provides the device specifications for the INCU Incubator Analyzer. For more information, please contact your Fluke Biomedical Service representative.

Temperature Measurements

Conduction:	1 sensor in contact with mattress (bottom of unit)
Convection (Inside the incubator):	3 sensors (T1, T3, T4)
Radiation:	1 sensor (T2) connected to the so-called “radiant baby”
Convection (Inside or outside the incubator):	1 sensor T2
Measuring Range:	5°C to 70°C
Resolution:	0.1°C
Accuracy:	Reading Value ±0.5°C ± 1 LSB for the range from 25°C to 40°C
Storage Temperature	-20°C to 50°C
Operating Temperature:	10°C to 40°C
Dimensions***:***	27 x 14 x 20 cm

Relative Humidity

Measuring Range:	0% RH to100% RH
Resolution:	0.1% RH
Accuracy:	±5% RH (for range 0 to 90% RH @ 25°C to 40°C) or, ± 5.3 % RH (for range 0 to 100% RH @ 25°C to 40°C) Humidity must be without condensation.

Air Flow

Measuring Range:	0.1-0.7 m/s
Resolution:	0.01 m/s
Accuracy:	From 0.1 m/s to 0.5 m/s reading ±0.1 m/s @ temperature 25°C to 40°C and humidity 50% RH ± 15% RH

Noise

Measuring Range:	30- 80 dbA
Resolution:	0.1 dbA
Accuracy:	±5 dbA @ 30-80 dbA

Display

2 x 16 Super Twist LCD

Measuring Interval

Via PC: Adjustable from 1 to 10 minutes

Internal Memory

Capacity: 1470 measurements
(210 records of 7 parameters)

Supply

Power Requirements:	Maximum over-voltage:	264 VAC
	Input voltage range:	100 to 240 VAC
	Input frequency range:	47 to 63 Hz
	Power consumption:	< 60 Volt Amperes
	Fuse rating:	2A Slow Blow

Battery: Rechargeable sealed lead-acid type
NP7-6 YUASA, 6V, 7 Ah
dimensions 151 x 34.x 101.0 mm

Operates for 24 hours continuously without the low-battery warning

Charger 600 mA minimum, 8 VAC-DC
(Charger must be agency-approved, depending on the country)

Protection Factor: IP 30	
	The first index digit -3 means that the unit is protected from object access of solid foreign matter larger than 2.5 mm in diameter. The second index digit - 0 means no protection.
Weight:	3 kg

Appendix B: Report Examples

Inside This Chapter

- Monitoring Sheet
- History Graph Sheet
- Parameter Numerical List

Report Examples

This appendix provides examples of reports (*Figures B-1* through *B-3*) that can be generated and/or printed from the INCU Incubator Analyzer. Refer to *Chapter 4, INCU PC Software Operation* for details on how to print these reports.

Fluke Biomedical
Incubator Analyzer
Ver 2.05

12/10/2001

Monitoring sheet

Manufacturer :

Type :

Incubator serial no. : 1234

Marker 1: M1

Marker 2:

Marker 3:

Marker 4:

Marker 5:

Temperature order :

Hygrometry order :

Sampling interval : 08 min

Number of samples : 145

Start time of the acquisition : 08:24:00

Department name :

Procedure no. :

Information :

Check : Successful [ ] Failed [}

Operator name : Operator name

Signature :

Site name
Address
Ver 2.05
C:\Program Files\INCU\DEMO205.DAT

Page 1/9

Figure B-1. Sample monitoring sheet

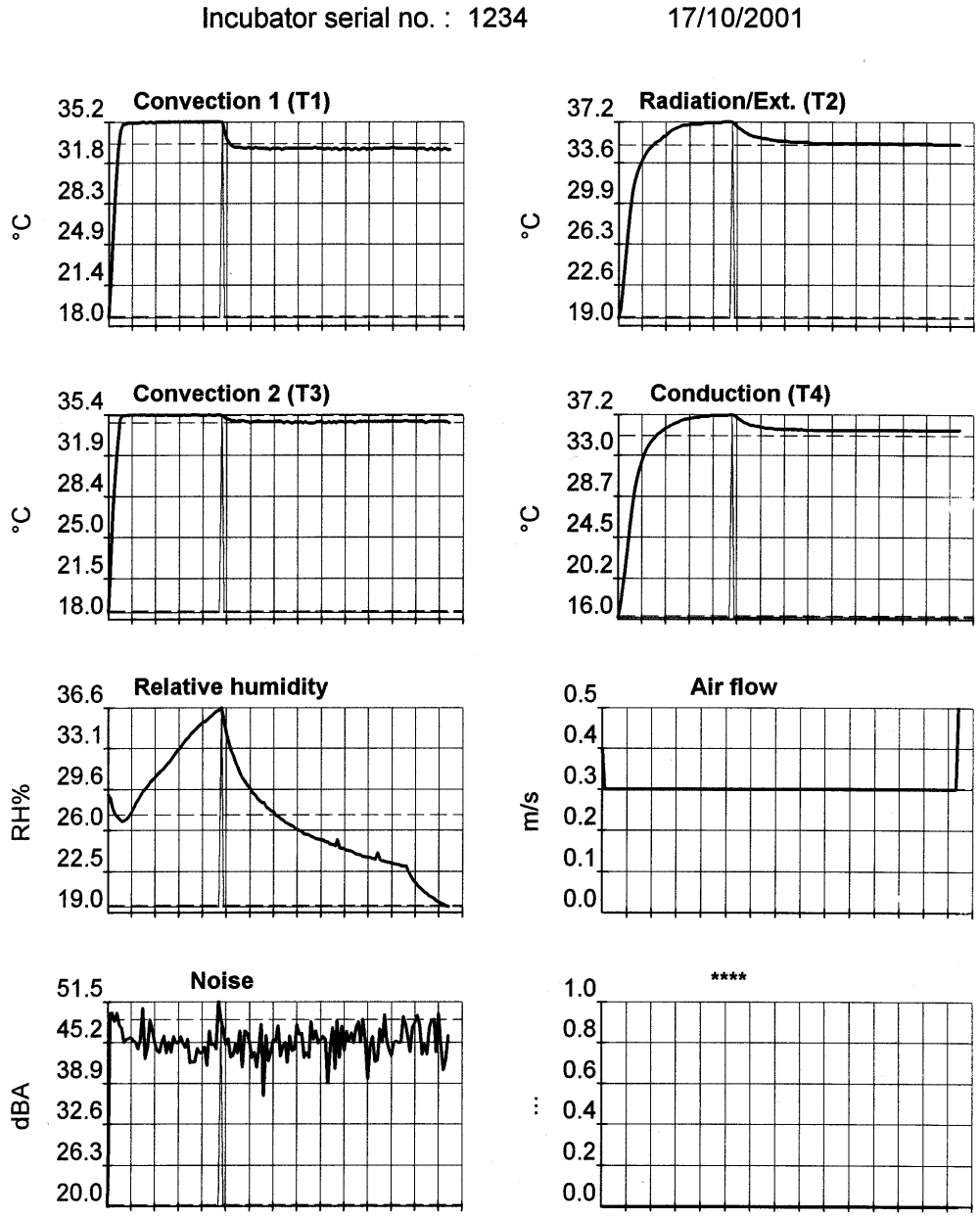


Figure B-2. Sample history graph sheet

Incubator serial no. : 1234 17/10/2001

Numeric list for the parameter Convection 1 (T1)

The first item is the sample number
The second item is the value of the measurement in tenths

0001 : 0187	0002 : 0222	0003 : 0258	0004 : 0295	0005 : 0327	0006 : 0344	0007 : 0350	0008 : 0350
0009 : 0351	0010 : 0351	0011 : 0351	0012 : 0351	0013 : 0351	0014 : 0351	0015 : 0352	0016 : 0352
0017 : 0351	0018 : 0352	0019 : 0352	0020 : 0351	0021 : 0352	0022 : 0352	0023 : 0352	0024 : 0352
0025 : 0352	0026 : 0352	0027 : 0352	0028 : 0352	0029 : 0352	0030 : 0352	0031 : 0352	0032 : 0352
0033 : 0352	0034 : 0352	0035 : 0352	0036 : 0352	0037 : 0352	0038 : 0352	0039 : 0352	0040 : 0352
0041 : 0352	0042 : 0352	0043 : 0352	0044 : 0352	0045 : 0352	0046 : 0352	0047 : 0352	0048 : 0352
0049 : 0352	0050 : 0343	0051 : 0337	0052 : 0334	0053 : 0332	0054 : 0331	0055 : 0331	0056 : 0331
0057 : 0331	0058 : 0330	0059 : 0330	0060 : 0331	0061 : 0330	0062 : 0330	0063 : 0331	0064 : 0330
0065 : 0330	0066 : 0330	0067 : 0330	0068 : 0330	0069 : 0329	0070 : 0330	0071 : 0330	0072 : 0330
0073 : 0330	0074 : 0329	0075 : 0330	0076 : 0330	0077 : 0330	0078 : 0330	0079 : 0330	0080 : 0330
0081 : 0330	0082 : 0330	0083 : 0330	0084 : 0330	0085 : 0330	0086 : 0330	0087 : 0330	0088 : 0331
0089 : 0330	0090 : 0330	0091 : 0330	0092 : 0329	0093 : 0330	0094 : 0330	0095 : 0329	0096 : 0330
0097 : 0330	0098 : 0329	0099 : 0329	0100 : 0330	0101 : 0329	0102 : 0330	0103 : 0329	0104 : 0329
0105 : 0330	0106 : 0329	0107 : 0329	0108 : 0330	0109 : 0330	0110 : 0329	0111 : 0330	0112 : 0329
0113 : 0330	0114 : 0330	0115 : 0330	0116 : 0330	0117 : 0330	0118 : 0330	0119 : 0330	0120 : 0330
0121 : 0331	0122 : 0330	0123 : 0330	0124 : 0330	0125 : 0330	0126 : 0330	0127 : 0330	0128 : 0330
0129 : 0330	0130 : 0330	0131 : 0329	0132 : 0330	0133 : 0330	0134 : 0330	0135 : 0329	0136 : 0329
0137 : 0330	0138 : 0329	0139 : 0329	0140 : 0330	0141 : 0329	0142 : 0329	0143 : 0330	0144 : 0329
0145 : 0329							

Minimum value: 18,7 °C Maximum value: 35,2 °C Average value: 33,4 °C

Site name
Address
Ver 2.05
C:\Program Files\INCU\DEMO205.DAT

Figure B-3. Sample parameter numerical list

Appendix C: DAT File Format

C

Inside This Chapter

- DAT File Format

The DAT File is a text file that may be imported into popular spreadsheet programs for further processing and/or analysis. The following is the format of the DAT file stored by the INCU PC Software.

File *.DAT			
	ASCII	Hex	Hex
Key word for INCU file identification	LFCL	0D	0A
Incubator serial number	0123	0D	0A
Total measurement time	0145	0D	0A
Sampling interval	0010	0D	0A
Name of channel 1	Convection 1 (T1)	0D	0A
	0187	0D	0A
Data sent by the sensor. Written in tenths.	0222	0D	0A
	0258	0D	0A
Event markers indicated by an M preceding the value	M295	0D	0A
Name of channel 2	Radiation/Ext. (T2)	0D	0A
	0197	0D	0A
Data sent by the sensor, in tenths	0205	0D	0A
	0224	0D	0A
	0247	0D	0A
Name of channel 3	Convection 2 (T3)	0D	0A
	0186	0D	0A
Data sent by the sensor, in tenths	0232	0D	0A
	0271	0D	0A
	0302	0D	0A
Name of channel 4	Conduction (T4)	0D	0A
	0162	0D	0A
Data sent by the sensor, in tenths	0175	0D	0A
	0190	0D	0A
	0209	0D	0A
Name of channel 5	Relative humidity	0D	0A
	0291	0D	0A
Data sent by the sensor, in tenths	0288	0D	0A
	0280	0D	0A
	0275	0D	0A
Name of channel 6	Air flow	0D	0A
	0040	0D	0A
Data sent by the sensor, in hundredths	0030	0D	0A
	0030	0D	0A
	0030	0D	0A
Name of channel 7	Noise	0D	0A
	0200	0D	0A
Data sent by the sensor, in tenths	0498	0D	0A
	0498	0D	0A
	0485	0D	0A
Name of channel 8	****	0D	0A
Future Option	0000	0D	0A
	0000	0D	0A
	0000	0D	0A
	0000	0D	0A

File *.DAT			
	ASCII	Hex	0A
Incubator serial number fields (14 characters maximum)	1234	0D	0A
Marker 1 comment field (28 characters maximum)	M1	0D	0A
Marker 2 comment field (28 characters maximum)		0D	0A
Marker 3 comment field (28 characters maximum)		0D	0A
Marker 4 comment field (28 characters maximum)		0D	0A
Marker 5 comment field (28 characters maximum)		0D	0A
Marker 5 comment field (28 characters maximum)		0D	0A
Incubator Type fields (8 characters maximum)		0D	0A
Procedure n fields (28 characters maximum)		0D	0A
Temperature Settings fields (28 characters maximum)		0D	0A
Humidity Settings fields (28 characters maximum)		0D	0A
Start time of the acquisition	08:00:00	0D	0A
End Of File (7E hex)	~	0D	0A